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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/665,997	09/18/2003	Eric Duchesne	END920030026US1 (16594)	6606

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EXAMINER	
NOVACEK, CHRISTY L	

ART UNIT	PAPER NUMBER
2822	

DATE MAILED: 06/19/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/665,997	DUCHESNE ET AL.	
	Examiner	Art Unit	
	Christy L. Novacek	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4,5,9-12,14,15,19 and 20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4,5,9-12,14,15,19 and 20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

This office action is in response to the request for continued examination and the amendment filed June 1, 2006.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on June 1, 2006 has been entered.

Response to Amendment

The amendment of claims 1 and 11 is sufficient to overcome the rejection of claims 1, 2, 4, 5, 9-12, 14, 15, 19 and 20 under 35 U.S.C. 112, first paragraph stated in the previous office action. Therefore, this rejection is withdrawn.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1, 2, 4, 5, 9-12, 14, 19 and 20 are rejected under 35 U.S.C. 103(s) as being unpatentable over Katchmar (US 6,392,890, previously cited) in view of the admitted prior art and Barber et al. (US 6,590,292, previously cited).

Regarding claims 1, 2, 4, 9, 12, 14 and 19, Katchmar discloses providing an electronic component (14) having a first surface in electrical communication with a substrate (12),

arranging a heat spreader (16) made of a heat-absorbing and dissipating material in a closely spaced relationship with an opposite surface of the semiconductor chip, and adhesive means bonding the heat spreader to the electrical component, wherein the adhesive means includes an electrically conductive silicone adhesive (42) positioned in a single spot on a center surface portion of the electrical component and an electrically non-conductive silicone adhesive (36) of an extensively larger surface area than the single spot formed by the electrically conductive silicone adhesive extending about the electrically conductive silicone adhesive for concurrently bonding the heat spreader to the electronic component (Fig. 1a-2c; col. 2, ln. 53 – col. 6, ln. 49). Katchmar discloses that the electrically non-conductive silicone adhesive is extending into proximity with edges of the semiconductor chip. The word "proximity" as used herein, is being given the ordinary definition known in the art of "the state of being very near, close" (Merriam-Webster's Collegiate Dictionary (MWCD) (Tenth Edition) gives the definition for "proximity" as "the quality or state of being proximate"; the MWCD gives the definition for "proximate" as "**1:** immediately preceding or following **2 a:** very near: CLOSE **b:** soon forthcoming: IMMINENT").

Katchmar does not specifically disclose the electronic component to be a semiconductor chip. As recited in the admitted prior art (pg. 1-4 of the specification), a semiconductor chip attached to a printed circuit board and a heat spreader is well-known and conventional in the art. At the time of the invention, it would have been obvious to one of ordinary skill in the art that the "electronic component" of Katchmar includes a semiconductor chip because this method of forming an electronic component is well-known and conventional in the art.

Katchmar does not disclose a specific size of the single spot of electrically conductive adhesive; neither does Katchmar disclose a specific size of the electrically non-conductive adhesive. Instead, Katchmar (col. 4, ln. 52-58; col. 5, ln. 11-23) states, "The amounts of the electrical insulator material 36 and the good thermally conductive material 42 used in a particular situation depend upon surrounding circumstances including the nature of the materials 36, 42, the temperature, the volume of the gap 21 and the area of the surface of the component 14 (or DLA or overmold (not shown)) facing the gap 21." At the time of the invention, it would have been obvious to one of ordinary skill in the art to use routine experimentation to determine optimal diameters of the adhesives of Katchmar, depending upon the nature of the material, the temperature, the volume of the gap between the electronic component and the heat spreader and the area of the surface of the electronic component because such variables of art recognized importance are subject to routine experimentation and discovery of an optimum value for such variables is obvious. See *In re Aller*, 105 USPQ 233 (CCPA 1955).

Katchmar does not disclose that the electrically non-conductive adhesive is thermally conductive. Like Katchmar, Barber discloses a process of attaching a chip to a heat spreading using an adhesive material. Barber teaches that the adhesive should be made of thermally conductive material. The thermally conductive adhesive advantageously allows maximum heat transfer between the electronic component and the heat spreader. At the time of the invention, it would have been obvious to one of ordinary skill in the art to use a thermally conductive adhesive for Katchmar's electrically non-conductive adhesive as taught by Barber because the thermal conductivity of the adhesive would allow maximum heat transfer from the electronic component to the heat spreader.

Katchmar does not disclose from what kind of material the heat spreader is made. Like Katchmar, Barber discloses attaching an electrical component to a heat spreader using an electrically conductive adhesive. Barber teaches that the heat spreader may advantageously be made of copper and, thereby, the electrically conductive adhesive can electrically connect the heat spreader and the electrical component to ground the heat spreader, which provides the benefit of reducing electromagnetic interference effects (col. 5, ln. 43-45; col. 6, ln. 22-35). At the time of the invention, it would have been obvious to one of ordinary skill in the art to form the heat spreader of Katchmar of copper so that it may be electrically connected to the electronic component as taught by Barber because Barber teaches that it is advantageous to electrically connect the heat spreader to the electronic chip in order to reduce electromagnetic interference effects.

Regarding claims 5 and 15, Katchmar does not disclose that the heat spreader includes a plate-shaped lid or cap member. Barber shows a plate-shaped heat spreader. At the time of the invention, it would have been obvious to one of ordinary skill in the art to form the heat spreader of Katchmar such that it is plate-shaped, as shown by Barber, because the a plate-shaped heat spreader forms a smaller and more structurally stable heat spreader than one with fins.

Regarding claims 10 and 20, Katchmar discloses spacing the heat spreader from the electronic component, but does not disclose a specific thickness of the space. Instead, Katchmar (col. 3, ln. 4-8) states, "The height of the gap 21 may depend upon the size of the components 14 and may vary from one component to another." At the time of the invention, it would have been obvious to one of ordinary skill in the art to use routine experimentation to determine the thickness of the spacing between the heat spreader and the electronic component of Katchmar,

depending upon the size of the electronic component, the size of the heat spreader, and the amount of adhesive required to fix the heat spreader and the electronic component together because such variables of art recognized importance are subject to routine experimentation and discovery of an optimum value for such variables is obvious. See *In re Aller*, 105 USPQ 233 (CCPA 1955).

Regarding claim 11, Katchmar discloses providing an electronic component (14) having a first surface in electrical communication with a substrate (12), arranging a heat spreader (16) made of a heat-absorbing and dissipating material in a closely spaced relationship with an opposite surface of the semiconductor chip, and adhesive means bonding the heat spreader to the electrical component, wherein the adhesive means includes an electrically conductive silicone adhesive (42) positioned in a single spot on a center surface portion of the electrical component and an electrically non-conductive silicone adhesive (36) of an extensively larger surface area than the single spot formed by the electrically conductive silicone adhesive extending about the electrically conductive silicone adhesive for concurrently bonding the heat spreader to the electronic component (Fig. 1a-2c; col. 2, ln. 53 – col. 6, ln. 49). Katchmar discloses that the electrically non-conductive silicone adhesive is extending into proximity with edges of the semiconductor chip. The word "proximity" as used herein, is being given the ordinary definition known in the art of "the state of being very near, close" (Merriam-Webster's Collegiate Dictionary (MWCD) (Tenth Edition) gives the definition for "proximity" as "the quality or state of being proximate"; the MWCD gives the definition for "proximate" as "**1:** immediately preceding or following **2 a:** very near: CLOSE **b:** soon forthcoming: IMMINENT").

Katchmar does not specifically disclose the electronic component to be a semiconductor chip. As recited in the admitted prior art (pg. 1-4 of the specification), a semiconductor chip attached to a printed circuit board and a heat spreader is well-known and conventional in the art. At the time of the invention, it would have been obvious to one of ordinary skill in the art that the "electronic component" of Katchmar includes a semiconductor chip because this method of forming an electronic component is well-known and conventional in the art.

Katchmar does not disclose a specific size of the single spot of electrically conductive adhesive; neither does Katchmar disclose a specific size of the electrically non-conductive adhesive. Instead, Katchmar (col. 4, ln. 52-58; col. 5, ln. 11-23) states, "The amounts of the electrical insulator material 36 and the good thermally conductive material 42 used in a particular situation depend upon surrounding circumstances including the nature of the materials 36, 42, the temperature, the volume of the gap 21 and the area of the surface of the component 14 (or DLA or overmold (not shown)) facing the gap 21." At the time of the invention, it would have been obvious to one of ordinary skill in the art to use routine experimentation to determine optimal diameters of the adhesives of Katchmar, depending upon the nature of the material, the temperature, the volume of the gap between the electronic component and the heat spreader and the area of the surface of the electronic component because such variables of art recognized importance are subject to routine experimentation and discovery of an optimum value for such variables is obvious. See *In re Aller*, 105 USPQ 233 (CCPA 1955).

Katchmar does not disclose that the electrically non-conductive adhesive is thermally conductive. Like Katchmar, Barber discloses a process of attaching a chip to a heat spreading using an adhesive material. Barber teaches that the adhesive should be made of thermally

conductive material. The thermally conductive adhesive advantageously allows maximum heat transfer between the electronic component and the heat spreader. At the time of the invention, it would have been obvious to one of ordinary skill in the art to use a thermally conductive adhesive for Katchmar's electrically non-conductive adhesive as taught by Barber because the thermal conductivity of the adhesive would allow maximum heat transfer from the electronic component to the heat spreader.

Katchmar does not disclose that the electrically non-conductive silicone adhesive is extending into proximity with edges of the heat spreader. However, at the time of the invention, it would have been obvious to one of ordinary skill in the art to form the adhesive such that it can extend to the edges of the heat spreader (as is shown in Fig. 4 of Barber, for example), depending upon the size of the heat spreader.

Response to Arguments

Applicant's arguments filed June 1, 2006 have been fully considered but they are not persuasive.

Regarding the rejection of claims 1 and 11, Applicant argues that the electrically conductive silicone adhesive 42 of Katchmar allegedly encompasses a large portion of the surface area of the chip. However, Katchmar specifically encourages one of ordinary skill in the art to determine an appropriate ratio of electrically conductive adhesive to non-electrically conductive adhesive, depending upon individual circumstances. Katchmar states,

> "When the electrical insulator material **36** is initially injected into the gap **21**, as shown in FIG. 1b, a sufficient amount should be injected so that it will ultimately be able to confine the good thermally conductive material **42** between the component **14** and the planar body **18**. However, ideally, the electrical insulator material should not extend beyond the edges of the component **14**.

> *There are several methods for determining how much of the electrical insulator material **36** to inject, which would be known to those skilled in the art.* For example, if the height of the gap **21** is known (ie: the distance between the component **14** and the planar surface **18**), then the volume of the electrical insulator material **36** to be injected can be calculated. If the height of the gap **21** is not known, then there are several methods for determining the height, such as, for example, inserting a dip stick (not shown) into the hole **34**. If the height of the hole **34** is known, then the height of the gap **21** is calculated by subtracting the height of the hole **34** from the dip stick measurement.
>
> The amount of good thermally conductive material **42** to inject depends upon the particular circumstances. There should be a sufficient amount of the good thermally conductive material **42** to bridge the gap **21** between the component **14** and the planar surface **18**. However, *there should not be so much good thermally conductive material **42** such that there would be insufficient electrical insulator material **36** to contain it between the component **14** and the planar surface **18***. Similarly, there should not be so much good thermally conductive material **42** such that the injection of the good thermally conductive material **42** would push the electrical insulator material **36** beyond the edges of the component **14**.
>
> According to one aspect of an embodiment, there is approximately a ratio of three to seven of the good thermally conductive material **42** to the electrical insulator material **36**. However, *an infinite number of other ratios could also be used.*" (emphasis added) col. 4, ln. 59 – col. 5,ln. 11-28.

Therefore, it would have been obvious to one of ordinary skill in the art to use routine experimentation, as suggested by Katchmar, to determine appropriate amounts of the adhesives.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christy L. Novacek whose telephone number is (571) 272-1839. The examiner can normally be reached on Monday-Thursday and alternate Fridays 7:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on (571) 272-2429. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

CLN
June 9, 2006

Zandra V. Smith
Supervisory Patent Examiner
12 June 2006